
Renal Puncture

A Neglected Aid in the Diagnosis of Renal Masses

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■ *Renal arteriography and nephrotomography are useful in distinguishing between renal neoplasms and cysts. In the great majority of cases the well-vascularized neoplasm is readily identified. However, the arteriographic diagnosis of an "avascular lesion" is incomplete. These lesions make up a widely heterogeneous group, including the common simple renal cysts, avascular and degenerated neoplasms and congenital malformations. Percutaneous puncture of these "avascular" lesions under image-amplified fluoroscopy is a safe and simple means of obtaining further diagnostic information, often of decisive value.*

THE DIFFERENTIATION of carcinoma of the kidney from a cyst of the kidney is one of the more common problems facing the diagnostic radiologist. This is of more than academic interest, for many authorities now feel that the uncomplicated renal cyst requires no treatment. On the other hand, if carcinoma of the kidney can be diagnosed preoperatively, the kidney and the tumor can be removed intact without biopsy at the operating table.

The probability of a cyst and a neoplasm occurring in the same kidney was recently examined in a review of 1007 kidneys removed for a renal mass at the Mayo Clinic.⁷ The incidence of co-existing cyst and neoplasm was 1 per cent. In no case was a carcinoma found inside a serous cyst that contained clear fluid.

Most of us when confronted with a renal mass on urography will turn to renal arteriography or nephrotomography to distinguish between a neoplasm or a cyst. With optimal technique an accuracy of 90 per cent can be achieved. Most renal tumors are highly vascular and the demonstration of a vascular stain or pathologic change in vessels is reliable evidence of a neoplasm. The opposite finding—"no vascular stain or change in vessels; mass most likely cystic"—is made with less assurance. Arteriography and nephrotomography are therefore particularly effective in selecting cases in which operation is needed.

An approach that deserves wider use is percutaneous puncture of renal masses. Sporadic series of renal punctures have been reported since 1939 with puncture limited to large, palpable masses.^{1,3} In 1952 Lindblom described a series of 80 cases in which puncture was done under fluoroscopic control. This Swedish series has now

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been expanded to over 700 cases.^{6,5} In this country DeWeerd⁴ in 1963 reported the use of this method in 59 poor-risk patients without other evidence to suggest neoplasm. In a 1953 report on the inaccuracies of arteriography, Creevy and Price² made this statement: "The only dependable, nonsurgical means of recognizing simple cysts and those containing neoplasms consists of aspirating the cyst and replacing the fluid with contrast medium. . . . This method, however, is safe only with palpable masses, . . . [hence] a technique of limited applicability." Today, this limitation no longer holds, for with image-amplified fluoroscopy it is possible to direct a needle with great accuracy without excessive radiation exposure. In order to diagnose more completely the avascular renal mass, we have used this procedure in 25 patients since 1962.

Technique. After suitable premedication, 25 ml of methylglucamine diatrizoate is injected intravenously to opacify the renal drainage structures. The patient is then placed prone on the fluoroscopic table and the site of the mass is determined. The overlying skin and fascia are anesthetized and an 18- to 20-gauge needle of suitable length is advanced into the mass under fluoroscopic control. The mass is aspirated and any fluid obtained is sent for cytologic examination. The cavity is then filled with contrast medium and roentgenograms are made in various projections to outline its walls. The needle is then withdrawn and the patient kept overnight for observation.

Reports of Cases

Case 1. A 50-year-old man had been discharged from the hospital three weeks previously following an uneventful recovery from operation for a herniated intervertebral disc. His present complaints were bilateral flank pain of three days' duration, with fever and chills during the last 24 hours. Temperature was 101°F, and bilateral costovertebral tenderness was elicited, somewhat more severe on the left. Urinalysis showed many bacteria and white cells. A culture of urine grew *E. coli*. A diagnosis of pyelonephritis was made and the patient responded promptly to antibiotic therapy. An excretory urogram was performed three days later, at which time the patient was afebrile and asymptomatic. This showed a 5 cm mass in the upper pole of the left kidney. Arteriography showed the mass to be avascular. Percutaneous puncture yielded 30 ml of thick pus. At operation an infected cyst was seen and *E. coli* grew on a culture of its contents (Figure 1).

Case 2. A 30-year-old woman was seen by her physician with complaints of gross hematuria, right flank pain and dysuria of 24 hours' duration. Microscopic examination of the urine disclosed many red and white cells. On treatment with sulfonamides the symptoms were promptly relieved. A subsequent excretory urogram demonstrated a 4 cm intrarenal mass on the left with calcification. Arteriography showed the mass to be avascular. On renal puncture the mass was found to be hard

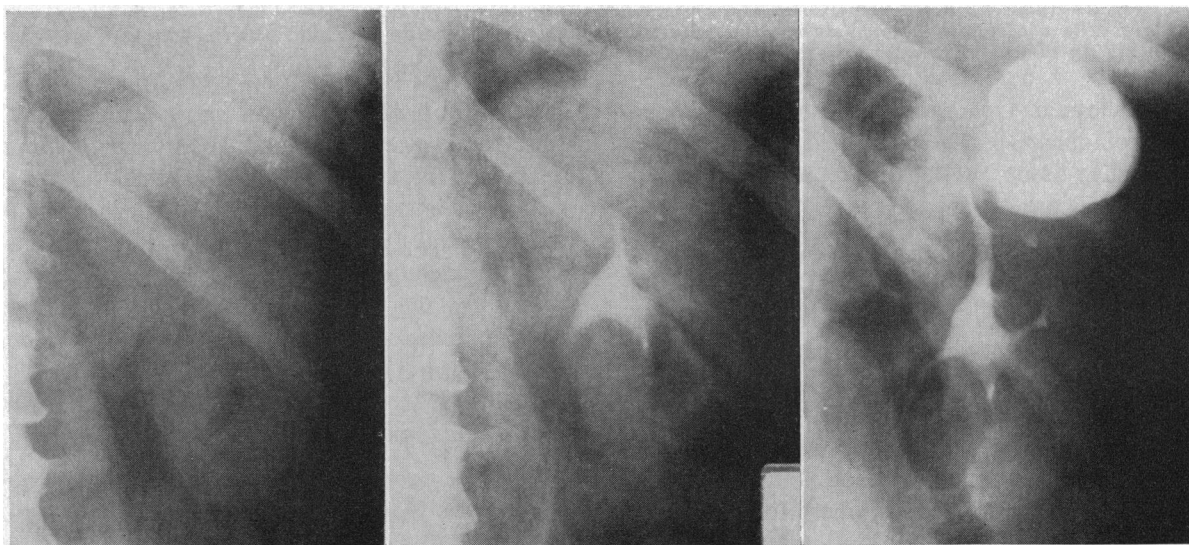


Fig. 1.—(Case 1) Infected renal cyst. *Left and center:* Mass in superlateral aspect of left kidney detected on excretory urogram. *Right:* Delineation of mass following percutaneous puncture, aspiration of pus and installation of contrast material.

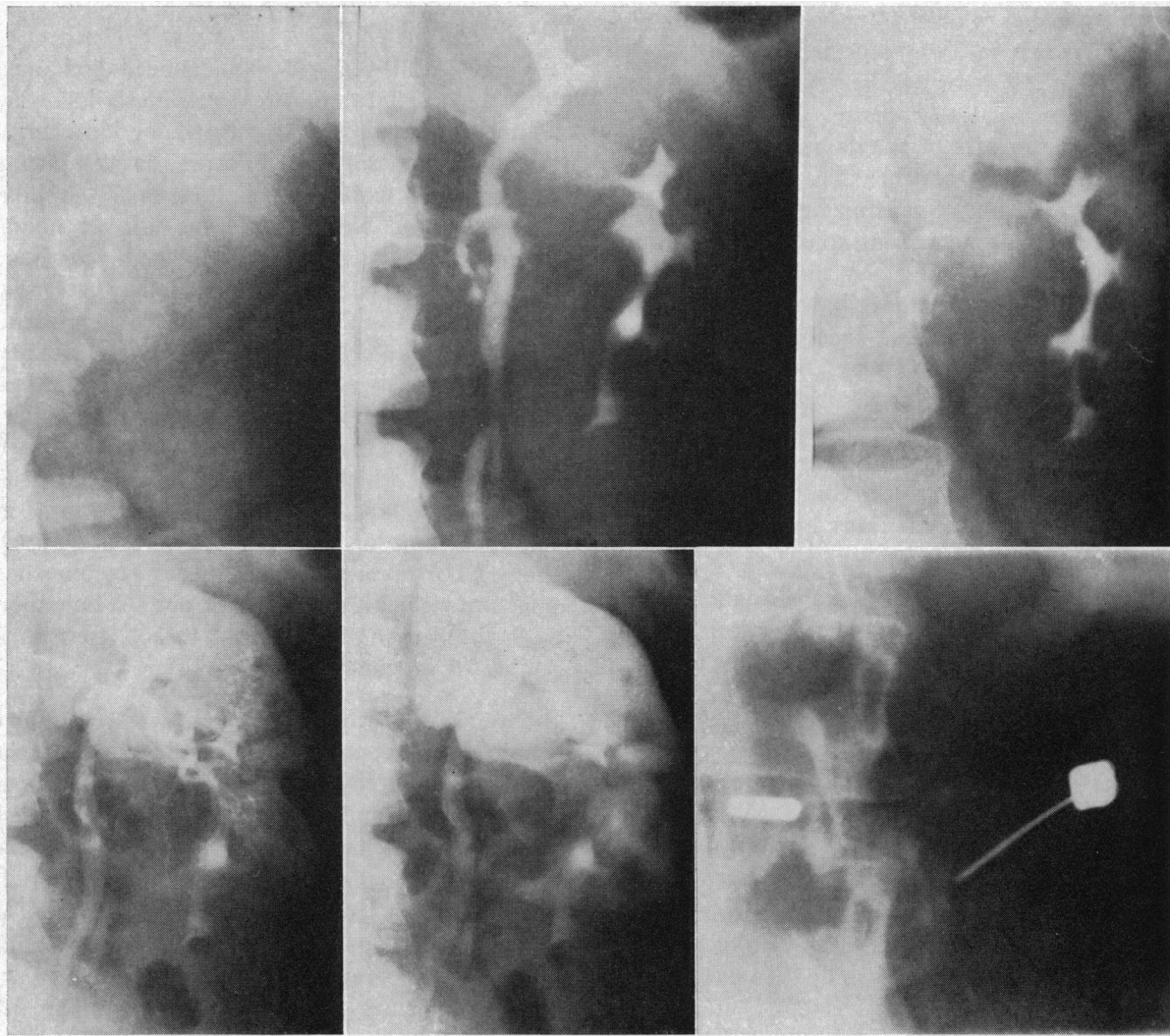


Fig. 2.—(Case 2) Renal hamartoma. Three urograms at top show irregularly calcified mass lesion at hilus of left kidney. The two frames at left below are arteriographs showing the mass is avascular. Lower right is a spot film showing tip of needle in solid mass lesion.

and noncystic. Operation disclosed an intrarenal mass of dense, partially calcified and hyalinized connective tissue, most likely representing a hamartoma (Figure 2).

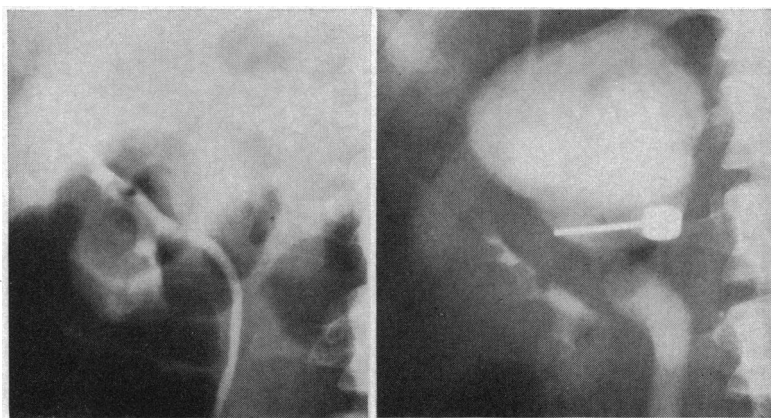
Case 3. A 43-year-old woman was admitted to hospital with gross hematuria and right flank pain of four hours' duration. During the preceding six weeks, she had noticed a dull ache in the right flank, nausea and anorexia. She said she had not had fever. She had had episodes of urinary tract infection four and ten years previously which had responded to treatment with antibiotics. An excretory urogram performed elsewhere four years before was reported as showing no abnormality. Positive physical findings on admission were limited to temperature of 99°F and slight tenderness

in the right flank. Urinalysis showed many white cells. Leukocytes numbered 16,000 per cu mm. A mass at the upper pole of the right kidney was seen on an excretory urogram, and an arteriogram demonstrated that the mass was avascular. Renal puncture identified the mass as a dilated collecting system draining the upper pole of the kidney via a reduplicated ureter opening into the bladder neck (Figure 3).

Complications

We have not observed any complications in our small series. However, since the technique is similar to that for needle excision for renal biopsy, the well-known complications of bleeding, infection and possibly arteriovenous fistula might be

Fig. 3.—(Case 3) Localized hydronephrosis. Film at left shows large mass involving superior pole of right kidney. Right frame shows percutaneous puncture of mass with instillation of contrast material to demonstrate obstructed collecting system to the superior pole of the kidney.



expected to occur. The incidence has proven acceptable in renal biopsy and an even lower complication rate would be expected in simple renal puncture.

The question of spread of a neoplasm by needle puncture cannot be answered simply. Needle excision of biopsy specimens from many kinds of neoplasms, such as those arising from the prostate, breast, head and neck, has been used for years. No difference in survival rates has been established between patients who had excision by needle and those who had other methods of biopsy or treatment.⁸ Edholm and coworkers⁵ noted a lower incidence of pulmonary metastasis in patients with kidney carcinoma who had renal puncture for biopsy than in those who did not. They conceded, however, that this might have been owing to earlier diagnosis. If puncture is limited to the mass already found avascular by arteriography, the only neoplasms punctured will be those that might otherwise have been misdiagnosed as "avascular, most likely cyst."

Discussion

Our experience indicates that percutaneous renal puncture under image-amplified fluoroscopy offers a safe, simple method of increasing the accuracy of diagnosis of kidney masses. We use the following as guides in determining the use of the procedure:

- A renal mass that is obviously neoplastic on urography requires surgical treatment. Little additional useful information is to be gained by extensive radiologic investigation.
- The more common renal mass without identifying characteristics on urography should be first

studied by arteriography or nephrotomography. If a tumor stain or pathological change in vessels is demonstrated, the treatment is surgical. If neither of these conditions is demonstrated and the lesion is "avascular," percutaneous renal puncture will confirm the benign, cystic nature of the lesion or afford clues to a more specific diagnosis.

- Under special circumstances, such as in aged, poor-risk patients, where arteriography or exploratory operation may be contraindicated, renal puncture will usually give decisive information with minimal morbidity.

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